Seat No. [ ]

Shivaji University, Kolhapur

Kamala College, Kolhapur

B.C.A (Part-I) (Semester – II)

Examination June 2022

Mathematical Foundation for Computer Application

Subject Code: 80872

Day and Date : Monday, 20/06/2022   Total Marks : 70
Time : 10:30 am to 1 : 30 pm

Instructions :

1) Que. 1 and Que. 6 are compulsory.
2) Attempt any three Questions from Que. No. 2 to Que. No. 5
3) Figure to the right indicate marks.

Q.1) A] Select the correct alternative for the each of the following.   [10]

i) If $A = \{3x/x \in N\}$ and $B = \{6x/x \in N\}$, then A n B is .....

a) $\{3x/x \in N\}$ b) $\{6x/x \in N\}$

c) $\{x/x \in N\}$ d) $\{2x/x \in N\}$

ii) Which of the following is not a statement (Proposition)?

a) $\sqrt{3}$ is a prime number   b) $\sqrt{2}$ is irrational

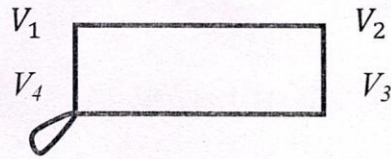c) Mathematics is an interesting subject   d) 5 is an even integer

iii) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $A^T = \begin{bmatrix} 1 & a \\ 2 & b \end{bmatrix}$

then the values of a and b are,

a) a = -2, b = 1   b) a = 2, b = 4
c) a = 3, b = 4   d) a = 1, b = 3

iv) The degree of vertex V4 in the following multigraph is....

a) 2   b) 3   c) 4   d) 5

v) The number of vertices in Km, n is....

a) $m + n$ b) $m^2 + n^2$ c) mn   d) $m - n$

vi) The set $\{x/x \in I,\ x^2 = $ is not positive$\}$ is ....

    a) Singleton set   b) null set
    c) Infinite set   d) none of these

vii) If P is false, q is true then truth value of$(p \leftrightarrow q) \wedge p$ is ....

    a) T   b) F   c) T and F   d) None of these

viii) Which of the following is not a singular matrix

   a) $\begin{bmatrix} 8 & 12 \\ 2 & 3 \end{bmatrix}$ b) $\begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$

   c) $\begin{bmatrix} -4 & 4 \\ -4 & 4 \end{bmatrix}$ d) $\begin{bmatrix} 8 & 12 \\ 2 & -3 \end{bmatrix}$

ix) The dual of the statement $(\sim p \wedge c) \vee q$ is .....

   a) $(p \vee c) \wedge q$ b) $(\sim p \vee t) \wedge q$
   c) $(p \vee t) \wedge q$ d) $(\sim p \vee c) \wedge q$

x) If $A = \{1,2,3\}$, then the number of elements in $A \times A$ is, ...

    a) 3   b) 6   c) 5   d) 9

B] Slove any Two of the following.   [10]

i) Determine the truth values of the following statements.

    a) $5 + 3 = 7$ or $2 + 1 = 4$

    b) $5 + 3 = 7$ if and only if $2 + 1 = 4$

c) It is not true that, if $1 + 1 = 2$ then $3 + 4 = 5$

d) Tokyo is in India or $3 + 6 = 9$

e) If $2 + 3 = 5$ then $5 - 1 = 4$

ii) If $A = \{1, 2, 3, 4\}$, $B = \{2, 4\}$ then find

    a) $A \times A$ b) $B \times B$ c) $A \times B$
    d) $B \times A$ e) $(A \times B) \, n \, (B \times A)$

iii) Define the terms : Graph, Regular Graph and Bi- partite graph. Give an example of each.

Q 2) a) Define null set with an example. **[10]**

There are 260 persons with skin disorder. If 150 had been exposed to the chemical A, 74 to the chemical B and 36 to both chemical A and B.

Find the number of persons exposed to,

    i)   Chemical A but not chemical B.
    ii) Chemical A or chemical B.

b)   What is a statement. Write the converse, inverse and contra-positive of following statement. 'If a sequence is bounded then it is convergent. ....

Q 3) a) Define Identity matrix. Find x and y if, **[10]**

$$[2\ 0\ 3] \left\{ 3 \begin{bmatrix} 6 & 3 \\ -1 & 2 \\ 5 & 4 \end{bmatrix} + 2 \begin{bmatrix} -4 & -1 \\ 1 & 0 \\ -3 & -4 \end{bmatrix} \right\} = [x, y]$$

b)   Explain matrix representation of graph. Draw a multigraph corresponding to adjacent matrix.

$$\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$$

Q 4) a) Define the term conjunction and using truth table, prove the following equivalence. **[10]**

$$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$$

b) Define symmetric matrix and give an example.

If $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix}$

Then show that,

(i) $AB \neq BA$ (ii) $(AB)' = B'A'$

Where A' is the transpose of matrix A ....

Q 5) a) If A = {1, 2, 3, 4}, B = {3, 4, 5, 6} C= {4, 5, 6, 7, 8} and **[10]**

universal set x ={1, 2, 3, 4, 5, 6, 7, 8, 9, 10}then verify the following.

i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

b) Define a determinant of order 3x3. Find the value of x if,

$$\begin{vmatrix} 1 & 2x & 4x \\ 1 & 4 & 16 \\ 1 & 1 & 1 \end{vmatrix} = 0$$

Q 6) Write note on any four of the following. **[20]**

i) Simple graph, multigraph, Pseudo graph, path, cycle.

ii) Properties of determinant

iii) Disjunction, implication, negation

iv) Scalar matrix, Non – singular matrix, upper triangular matrix.

v) Laws of sets

vi) Functions and its types.